What is claimed:

1. An all-ceramic slidable ball joint assembly for use in an all-ceramic, air-to-air, indirect heat exchanger, said ball joint assembly comprising in combination

(I) a spherical body having an outer surface and an inner surface and having a near side and a tube side, said near side and tube side having a center point, said near side having a truncated face to form a flat surface on said near side; said spherical body having an opening of essentially uniform size and a predetermined length through said center point from the near side through the tube side, said tube side having a truncated face to form a flat surface on said tube side; said outer surface of said spherical body being covered with a thin, soft, woven, ceramic fabric; and,

(II) a ceramic tube, said ceramic tube having a predetermined outside diameter which is larger in diameter than said spherical body opening, said ceramic tube having an end that is smaller in diameter than the diameter of the ceramic tube, wherein the reduced diameter end of the ceramic tube is insertable into said opening of the spherical body, the length of the smaller diameter on said end being equivalent to the predetermined length of the spherical body opening.

2. An all-ceramic slidable ball joint system comprising in combination:

(i) slidable ball joint assembly, wherein the slidable ball joint assembly is capable of being used in an all-ceramic, air-to-air, indirect heat exchanger, said ball joint assembly comprising in combination:

I) a spherical body having an outer surface and an inner surface and having a near side and a tube side, said near side and tube side having a center point, said near side having a truncated face to form a flat surface on said near side; said spherical body having an opening of essentially uniform size and a predetermined length through said center point from the near side through the tube side, said tube side having a truncated face to form a flat surface on said tube side; said outer surface of said spherical body being covered with a thin, soft, woven, ceramic fabric; and,

II) a ceramic tube, said ceramic tube having a predetermined outside diameter which is larger in diameter than said spherical body opening, said ceramic tube having an end that is smaller in diameter than the diameter of the ceramic tube, wherein the reduced diameter end of the ceramic tube is insertable into said opening of the spherical body, the length of the smaller diameter on said end being equivalent to the predetermined length of the spherical body opening;

ii) a tube sheet, said tube sheet comprised of:

a. an inner tile, said inner tile having at least one round opening therethrough and having an outside tile side and a tube side and an inside surface, said inner tile having a first engagement and closure means on the interior surface formed by the opening and near the outside tile side thereof; said inner tile having an arcuate notch in the near end and in the interior surface thereof, said arcuate notch mating essentially with the spherical body outer surface, and,

b. an outside tile, said outside tile having an outside tile top surface, an interior surface, a near end, and distal end and a vertical midpoint, there being a second engagement and closure means in said outside tile top surface to accommodate and mate with the first engagement and closure means of the inner tile; said outside tile having a second arcuate notch in the near end and in the outside tile interior surface thereof, said second arcuate notch mating with the spherical body outer surface, said outside tile having a curved face at the distal end that begins at near the outside tile interior surface and near the vertical midpoint, and ends at the outside tile distal and near the outside tile top surface, the near side of the spherical body and the outside tile interior surface near the spherical body forming a channeled opening between them;

(iii) a friable, crushable, gasket, said gasket located in said channeled opening.

3. An all-ceramic, air-to-air, indirect heat exchanger in which the system of claim 2 is used.

4. An all-ceramic, air-to-air, indirect heat exchanger that utilizes in combination:

(A) a plurality of all-ceramic slidable ball joint assemblies for use in an all-ceramic, air to air, indirect heat exchanger, each said ball joint assembly comprising in combination

(I) a spherical body having an outer surface and an inner surface and having a near side and a tube side, said near side and tube side having a center point, said near side having a truncated face to form a flat surface on said near side; said spherical body having an opening of essentially uniform size and a predetermined length through said center point from the near side through the tube side, said tube side having a truncated face to form a flat surface on said tube side; said outer surface of said spherical body being covered with a thin, soft, woven, ceramic fabric; and,

(II) a plurality of ceramic tubes, each said ceramic tube having a predetermined outside diameter which is larger in diameter than said spherical body opening, said ceramic tube having an end that is smaller in diameter than the diameter of the ceramic tube, wherein the reduced diameter end of the ceramic tube is insertable into said opening of the spherical body, the length of the smaller diameter on said end being equivalent to the predetermined length of the spherical body opening;

(B) a system comprising:

(i) at least two tube sheets each comprised of at least:

a. an inner tile having at least one round opening through it and having a outside tile side and a tube side and an inside surface, said inner tile having a first engagement and closure means on the interior surface formed by the opening and near the outside tile side thereof, said inner tile having an arcuate notch in the near end and in the interior surface thereof, said arcuate notch mating essentially with the spherical body outer surface;

b. an outside tile, said outside tile having a outside tile top surface, an interior surface, a near end, a distal end and a vertical midpoint, there being a second engagement and closure means in said outside tile top surface to accommodate and mate with the first engagement and closure means of the inner tile; said outside tile having an second arcuate notch in the near end and in the outside tile interior surface thereof, said second arcuate notch mating with the spherical body outer surface, said outside tile having a curved face at its distal end which begins at near the outside tile interior surface and near the vertical midpoint and ends at the outside tile distal end near the outside tile top surface, the near side of the spherical body and the outside tile interior surface near the spherical body forming a channeled opening between them;

(III) a friable, crushable, gasket, said gasket located in said channeled opening.

5. A novel, all-ceramic slidable ball joint assembly for use in an all-ceramic, air-to-air, indirect heat exchanger, said ball joint assembly comprising in combination:

(I) a spherical body having an outer surface and an inner surface and having a near side and a tube side, said near side and tube side having a center point, said near side having a truncated face to form a flat surface on said near side; said spherical body having an opening of essentially uniform size and a predetermined length through said center point from the near side through the tube side, said tube side having a truncated face to form a flat surface on said tube side; said outer surface of said spherical body being covered with a thin, soft, woven, ceramic fabric; and,

(II) a tube seal extender therein, said tube seal extender having a tubular configuration and having a near end and a distal end; said tube seal extender having a predetermined outside diameter on its near end which is smaller than the diameter of the second opening in the spherical body, said tube seal extender being insertable into said second opening of the spherical body and mating with the inner surface of the spherical body; said tube seal extender distal end having a pre-determined outside diameter which is smaller than the interior surface of the ceramic tube, which distal end is insertable into the ceramic tube and mates

with the interior surface of the ceramic tube; the near end of the tube seal extender compressing a friable, crushable, annular gasket which is located between the near end and the shoulder located in the second opening of the spherical body;

said outer surface of said spherical body being covered with a thin, soft, woven, ceramic fabric, said ceramic tube having an interior surface and a predetermined outside diameter which is larger in diameter than said second opening of the spherical body.

6. A novel all-ceramic slidable ball joint system comprising the slidable ball joint assembly of claim 1 in combination with

(i) a tube sheet wherein the tube sheet is comprised of:

a. an inner tile which forms part of a tube sheet, said inner tile having at least one round opening through it and having a outside tile side and a tube side and an inside surface, said inner tile having a first engagement and closure means on the interior surface formed by the opening and near the outside tile side thereof, said inner tile having an arcuate notch in the near end and in the interior surface thereof, said arcuate notch mating essentially with the spherical body outer surface, and,

b. a outside tile, said outside tile having a outside tile top surface, an interior surface, a near end, a distal end and a vertical midpoint, there being a second engagement and closure means in said outside tile top surface to accommodate and

mate with the first engagement and closure means of the inner tile; said outside tile having a second arcuate notch in the near end and in the outside tile interior surface thereof, said second arcuate notch mating with the spherical body outer surface, said outside tile having a curved face at its distal end which begins at near the outside tile interior surface and near the vertical midpoint and ends at the outside tile distal end near the outside tile top surface, said inner tile and said outside tile providing a channeled opening between them at their near ends, respectively;

(ii) a friable, crushable, gasket, said gasket located in said channeled opening.

7. An all-ceramic, air-to-air, indirect heat exchanger which comprises in combination:

(A) a plurality of all-ceramic slidable ball joint assemblies for use in an all-ceramic, air to air, indirect heat exchanger, each said ball joint assembly comprising in combination

(I) a spherical body having an outer surface and an inner surface and having a near side and a tube side, said near side and tube side having a center point, said near side having a truncated face to form a flat surface on said near side; said spherical body having an opening of essentially uniform size and a predetermined length through said center point from the near side through the tube side, said tube side having a truncated face to form a flat surface on said tube side; said outer surface of said spherical body being covered with a thin, soft, woven, ceramic

fabric; and,

(II) a plurality of ceramic tubes each such ceramic tube having a predetermined outside diameter which is larger in diameter than said opening in the spherical body, one end of the ceramic tube being insertable into said opening of the spherical body, said end of the ceramic tube which is insertable in said opening of the spherical body being of a diameter smaller than the diameter of the said spherical body opening, the length of the smaller diameter on said end being equivalent to the predetermined length of the spherical body opening;

(B) at least two tube sheets, wherein each said tube sheet is dislocated from the other tube sheet and each tube sheet supporting the slidable ball joint assemblies therein, each said tube sheet being comprised of:

a. an inner tile that has at least one round opening through it and has an outside tile side and a tube side and an inside surface, each said inner tile having a first engagement and closure means on the interior surface formed by the opening and near the outside tile side thereof; each said inner tile having an arcuate notch in the near end and in the interior surface thereof, said arcuate notch mating essentially with the spherical body outer surface, and,

b. an outside tile, each said outside tile having an outside tile top surface, an interior surface, a near end, a distal end and a vertical midpoint, there being a second

engagement and closure means in said outside tile top surface to accommodate and mate with the first engagement and closure means of the inner tile; said outside tile having an second arcuate notch in the near end and in the outside tile interior surface thereof, said second arcuate notch mating with the spherical body outer surface, said outside tile having a curved face at its distal end which begins at near the outside tile interior surface and near the vertical midpoint and ends at the outside tile distal end near the outside tile top surface, the near side of the spherical body and the outside tile interior surface near the spherical body forming a channeled opening between them, respectively,

(C) a friable, crushable, gasket, said gasket located in said channeled opening.

8. A forced-air cooled tube sheet assembly said tube sheet assembly comprising:

(I) a silicon carbide tube sheet having an outside edge and containing a plurality of circular openings transversely therethrough, each said traverse opening having contained therein an all ceramic ball joint assembly;

(II) said tube sheet being supported by a first firebrick wall which is a combination of firebrick at the outside edge of the tube sheeting and surrounding the entire outside edge,

said combination of firebrick in combination with the outside edge of the tube sheet forming a channel, there being located in said channel, a ceramic, crushable gasket;

(III) a second firebrick wall interfacing with the first firebrick wall and covering substantially the outside surface of the first brick wall leaving an opening at the point that the tube sheet is supported by the first firebrick wall;

(IV) a steel shell surrounding the second firebrick wall, said steel shell having an inside surface and an outside surface, the combination of the tube sheet, first brick wall, second brick wall, and the steel shell forming a second channel, said channel being filled with a refractory material;

said steel shell being discontinuous at the interface of the steel shell with the refractory material;

said discontinuity having two, essentially parallel, near edges;

(V) a bellows expansion joint comprising a housing fixedly attached to the outside surface of the steel shell and essentially covering the steel shell at the point that the refractory material meets the steel shell and such that the housing is capable of carrying forced air therethrough;

said steel shell having a flat steel strip fixedly attached to the inside surface of the steel shell, near the discontinuity and on only one edge of the discontinuity such that when heated, the flat steel strip slides upon the inside surface of the steel

shell on the opposite edge of the discontinuity to form a sliding expansion joint.

9. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein the refractory material is a dense, low porosity castable refractory material.

10. A forced-air cooled tube sheet assembly as claimed in claim 9 wherein the dense, low porosity castable refractory material contains therein a plurality of alloy metal anchors having a Y shape wherein there is a straight end and a forked end, said straight end having an end distal to the forked end wherein the distal end of the straight end of the Y is fixedly attached to the inside surface of the steel shell.

11. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein the refractory material is high alumina brick.

12. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein in addition, there is at least one air deflector within the base of the housing.

13. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein the all-ceramic ball joint assembly is a slidable ball joint assembly.

14. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein the ceramic ball joint assembly is a non-slidable ball joint assembly.

15. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein in addition, there is present a metal flashing on

the air side of each tube sheet and fixedly attached to the inside surface of the steel shell and extending between the refractory material in the second channel, to cover said refractory material and the crushable gasket, the leading edge of said flashing being anchored in a pre-cut slot in the outside face of each tube sheet, respectively.

16. An all ceramic, air-to-air indirect heat exchanger comprising in combination:

(I) a first housing having two lateral sides, and having an exit end with a distal end and a near end, and an entry end having a distal end and a near end, which first housing is comprised of high temperature alumina firebrick, said first housing
having a predetermined outside dimension, said first housing having an outside surface;

(II) a tube sheet located at each of the exit end and the entry end, said tube sheet having an outside dimension, which corresponds essentially to the outside dimension of the first housing;

(III) an exit end housing having an outside dimension essentially equivalent to the outside dimension of the first housing, said exit end housing having an outside surface; said exit end housing being aligned at the exit end near end to

the first housing at their respective outside dimensions, the distal end of the exit end housing having an outside dimension smaller than the near end of the exit end housing;

(IV) an entry end housing having an outside dimension essentially equivalent to the outside dimension of the first housing, said entry end housing having an outside surface; said entry end housing being aligned at the entry end near end to the first housing at their respective
outside dimensions, the distal end of the entry end housing having an outside dimension smaller than the near end of the entry end housing;

(V) said exit end housing and entry end housing being covered with an insulating firebrick which conforms to the outside surface of each of the exit end housing and the entry end housing;

(VI) a steel shell, said steel shell covering essentially the entire outside surface of the first housing and having an inside surface, the exit end housing and the entry end housing formed in a unitary shell such that there is formed a channeled opening, by the insulating firebrick covering of the first housing, the outside edge of the tube sheet, the insulating firebrick covering, respectively, of the exit end housing and the entry end housing, and the steel shell; said channel having

located therein a ceramic, crushable, gasket at the outside edge of the tube sheet; said channel having located therein a refractory material;

said steel shell being discontinuous at the interface of the steel shell with the refractory material;

said discontinuity having two, essentially parallel, near edges;

(VII) a bellows expansion joint comprising a housing fixedly attached to the outside surface of the steel shell and essentially covering the steel shell at the point that the refractory material meets the steel shell and such that the housing is capable of carrying forced air;

said steel shell having a flat steel strip fixedly attached to the inside surface of the steel shell, near the discontinuity and on only one edge of the discontinuity such that when heated, the flat steel strip slides upon the inside surface of the steel shell on the opposite edge of the discontinuity, to form a sliding expansion joint;

each said bellows expansion joint having at least one entry port and one exit port for the entry and exit of air, respectively;

(VIII) said tube sheets supporting a plurality of ball joints, said ball joints being locked into the tube sheets using an inner tile and an outer tile and a friable, crushable gasket being located in a channeled opening formed by locking the inner tile and outer tile together;

(IX) sufficient ceramic tubes supported on each end by the ball joints;

(X) Plenum openings through each of the lateral side of the first housing and extending through the steel shell, the insulating firebrick covering, and the high temperature alumina firebrick, to allow gas to enter one lateral opening and exit through the other lateral opening.

17. A heat exchanger as claimed in claim 16 wherein the steel shell has a plurality of metal radiators fixedly attached to the outside surface of the steel shell and within the bellows expansion joint (VII).

18. A heat exchanger as claimed in claim 16 wherein the entry end housing, the exit end housing, and each of the lateral openings of the first circular housing are adapted to metal plenums.

19. A heat exchanger as claimed in claim 16 wherein the refractory material is a dense, low porosity castable refractory material.

20. A heat exchanger as claimed in claim 19 wherein the dense, low porosity castable refractory material contains therein a plurality of alloy metal anchors having a Y shape wherein there is a straight end and a forked end, said straight end having an end distal to the forked end wherein the distal end of the straight end of the Y is fixedly attached toa the inside surface of the steel shell.

21. Two or more heat exchangers of claim 20 when joined in tandem to allow multiple passes of gas and air.

22. A heat exchanger as claimed in claim 15 wherein the refractory material is high alumina brick.

23. A heat exchanger as claimed in claim 16 wherein, in addition, there is at least one air deflector within the base of the housing.

24. A heat exchanger as claimed in claim 16 wherein the ball joints are slidable ball joints.

25. A heat exchanger as claimed in claim 16 wherein the ball joints are non-slidable ball joints.

26. An improved manufacturing system requiring indirect heat transfer, the improvement comprising utilizing one or more all ceramic air-to-air heat exchanger in said system, at least one such heat exchanger comprising:

an all ceramic, air-to-air indirect heat exchanger comprising in combination:

(I) a first housing having two lateral sides, and having an exit end with a distal end and a near end, and an entry end having a distal end and a near end, which first housing is comprised of high temperature alumina firebrick, said first housing having a predetermined outside dimension, said first housing having an outside surface;

(II) a tube sheet located at each of the exit end and the entry end, said tube sheet having a an outside dimension, which corresponds essentially to the outside dimension of the first housing;

((III) an exit end housing having a circular configuration and an outside dimension essentially equivalent to the outside dimension of the first housing, said exit end housing having an outside surface; said exit end housing being aligned at the exit end near end to the first housing at their respective outside dimensions, the distal end of the exit end housing having an outside dimension smaller than the near end of the exit end housing;

(IV) an entry end housing having an outside dimension essentially equivalent to the outside dimension of the first housing, said entry end housing having an outside surface; said entry end housing being aligned at the entry end near end to the first housing at their respective outside dimensions, the distal end of the entry end housing having an outside dimension smaller than the near end of the entry end housing;

(V) said exit end housing and entry end housing being covered with an insulating firebrick which conforms to the outside surface of each of the exit end housing and the entry end housing;

(VI) a steel shell, said steel shell covering the entire outside surface of the first housing and having an inside surface, the exit end housing and the entry end housing formed in a unitary shell such that there is formed a channelled opening by the insulating firebrick covering of the first housing, the outside edge of the tube sheet, the insulating firebrick covering, respectively, of the exit end housing and the entry end housing, and the steel shell; said channel having located therein a ceramic, crushable, gasket at the outside edge of the tube sheet; said channel having located therein a refractory material;

said steel shell being discontinuous at the interface of the steel shell with the refractory material;

said discontinuity having two, essentially parallel, near edges;

(VII) a bellows expansion joint comprising a housing fixedly attached to the outside surface of the steel shell and essentially covering the steel shell at the point that the refractory material meets the steel shell and such that the housing is capable of carrying forced air;

said steel shell having a flat steel strip fixedly attached to the inside surface of the steel shell, near the discontinuity and on only one edge of the discontinuity such that when heated, the flat steel strip slides upon the inside surface of the steel shell on the opposite edge of the discontinuity, to form a sliding expansion joint;

each said bellows expansion joint having at least one entry port and one exit port for the entry and exit of air, respectively;

(VIII) said tube sheets supporting a plurality of ball joints, said ball joints being locked into the tube sheets using an inner tile and an outer tile and a friable, crushable gasket being located in a channeled opening formed by locking the inner tile and outer tile together;

(IX) sufficient ceramic tubes supported on each end by the ball joints;

(X) Plenum openings through each of the lateral side of the first housing and extending through the steel shell, the insulating firebrick covering, and the high temperature alumina firebrick, to allow gas to enter one lateral opening and exit through the other lateral opening.

27. A manufacturing system as claimed in claim 26 in which the ball joints are slidable ball joints.

28. A manufacturing system as claimed in claim 26 in which the ball joints are non-slidable ball joints.

29. An improved manufacturing system as claimed in claim 26 which is used in a chemical manufacturing process.

30. An improved manufacturing system as claimed in claim 23 in which the chemical manufacturing process is the conversion of methane to methanol.

31. An improved manufacturing system for manufacturing carbon black, said system comprising in combination:

(i) a carbon black furnace;

(ii) a primary quench cooler;

(iii) an air pre-heater;

(iv) a secondary quench cooler;

(v) a waste gas burner;

(vi) a waste gas heater;

(vii) at least one bag filter and,

(viii) one or more all ceramic, air-to-air heat exchangers comprising in combination:

(I) a first housing having two lateral sides, and having an exit end with a distal end and a near end, and an entry end having a distal end and a near end, which first housing is comprised of high temperature alumina firebrick, said first housing having a predetermined outside dimension, said first housing having an outside surface;

(II) a tube sheet located at each of the exit end and the entry end, said tube sheet having an outside dimension, which corresponds essentially to the outside dimension of the first housing;

((III) an exit end housing having an outside dimension essentially equivalent to the outside dimension of the first housing, said exit end housing having an outside surface; said exit end housing being aligned at the exit end near end to the first housing at their respective outside dimensions, the distal end of the exit end housing having an outside dimension smaller than the near end of the exit end housing;

(IV) an entry end housing having an outside dimension essentially equivalent to the outside dimension of the first housing, said entry end housing having an outside surface, said entry end housing being aligned at the entry end near end to the first housing at their respective outside dimensions, the distal end of the entry end housing having an outside dimension smaller than the near end of the entry end housing;

(V) said exit end housing and entry end housing being covered with an insulating firebrick which conforms to the outside surface of each of the exit end housing and the entry end housing;

(VI) a steel shell, said steel shell covering the entire outside surface of the first housing and having an inside surface, the exit end housing and the entry end housing formed in

a unitary shell such that there is formed a channelled opening by the insulating firebrick covering of the first housing, the outside edge of the tube sheet, the insulating firebrick covering, respectively, of the exit end housing and the entry end housing, and the steel shell; said channel having located therein a ceramic, crushable, gasket at the outside edge of the tube sheet; said channel having located therein a refractory material;

said steel shell being discontinuous at the interface of the steel shell with the refractory material;

said discontinuity having two, essentially parallel, near edges;

(VII) a bellows expansion joint comprising a housing fixedly attached to the outside surface of the steel shell and

essentially covering the steel shell at the point that the refractory material meets the steel shell and such that the housing is capable of carrying forced air therethrough;

said steel shell having a flat steel strip fixedly attached to the inside surface of the steel shell, near the discontinuity and on only one edge of the discontinuity such that when heated, the flat steel strip slides upon the inside surface of the steel shell on the opposite edge of the discontinuity, to form a sliding expansion joint;

each said bellows expansion joint having at least one entry port and one exit port for the entry and exit of air, respectively;

(VIII) said tube sheets supporting a plurality of ball joints, said ball joints being locked into the tube sheets using an inner tile and an outer tile and a friable, crushable gasket being located in a channeled opening formed by locking the inner tile and outer tile together;

(IX) sufficient ceramic tubes supported on each end by the ball joints;

(X) Plenum openings through each of the lateral sides of the first housing and extending through the steel shell, the insulating firebrick covering, and the high temperature alumina firebrick, to allow gas to enter one lateral opening and exit through the opposite lateral opening.

32. An improved manufacturing system for manufacturing carbon black in which the ceramic, air-to-air indirect heat exchangers contain a ball joint which is a slidable ball joint.

33. An improved manufacturing system for manufacturing carbon black in which the ceramic, air-to-air indirect heat exchangers contain a ball joint which is non-slidable.

34. A process for manufacturing carbon black, the process utilizing the system of claim 31.

35. A process for manufacturing carbon black as claimed in claim 34 wherein the ball joints of the system are slidable ball

joints.

36. a process for manufacturing carbon black as claimed in claim 34 wherein the ball joints of the system ar non-slidable ball joints.

37. In an improved system for sludge destruction requiring indirect heat transfer, the improvement comprising utilizing one or more all ceramic air-to-air heat exchanges in said system, said system comprising in combination:

(A) a sludge feeder;

(B) a wet sludge feed housing;

(C) a hot air furnace;

(D) a rotary kiln;

(E) a dried sludge housing;

(F) a dried sludge conveyor;

(G) a dried sludge feed housing;

(H) a rotary kiln combuster;

(J) an ash housing;

(K) a combustion air blower;

(L) an ash conveyor and mixer;

(M) a secondary combustion chamber;

(N) a boiler;

(O) a moisture content controller;

(P) a lime injection system;

(Q) one or more bag houses;

(R) an induced draft fan and,

(S) one or more all ceramic, air-to-air heat exchangers comprising in combination:

(I) a first housing having two lateral sides, and having an exit end with a distal end and a near end, and an entry end having a distal end and a near end, which first housing is comprised of high temperature alumina firebrick, said first housing having a predetermined outside dimension, said first housing having an outside surface;

(II) a tube sheet located at each of the exit end and the entry end, said tube sheet having an outside dimension, which corresponds essentially to the outside dimension of the first housing;

(III) an exit end housing having a configuration and an outside dimension essentially equivalent to the outside dimension of the first housing, said exit end housing having an outside surface; said exit end housing being aligned at the exit end near end to the first housing at their respective outside dimensions, the distal end of the exit end housing having an outside dimension smaller than the near end of the exit end housing;

(IV) an entry end housing having an outside dimension essentially equivalent to the outside dimension of the first housing, said entry end housing having an outside surface; said entry end housing being aligned at the entry end near end to the first housing at their respective outside dimensions, the

distal end of the entry end housing having an outside dimension smaller than the near end of the entry end housing;

(V) said exit end housing and entry end housing being covered with an insulating firebrick which conforms to the outside surface of each of the exit end housing and the entry end housing;

(VI) a steel shell, said steel shell covering the entire outside surface of the first housing and having an inside surface, the exit end housing and the entry end housing formed in a unitary shell such that there is formed a channeled opening by the insulating firebrick covering of the first housing, the outside edge of the tube sheet, the insulating firebrick covering, respectively, of the exit end housing and the entry end housing, and the steel shell; said channel having located therein a ceramic, crushable, gasket at the outside edge of the tube sheet; said channel having located therein a refractory material;

said steel shell being discontinuous at the interface of the steel shell with the refractory material, said discontinuity having two, essentially parallel, near edges;

(VII) a bellows expansion joint comprising a housing fixedly attached to the outside surface of the steel shell and essentially covering the steel shell at the point that the refractory material meets the steel shell and such that the housing is capable of carrying forced air therethrough;

said steel shell having a flat steel strip fixedly attached

to the inside surface of the steel shell, near the discontinuity and on only one edge of the discontinuity such that when heated, the flat steel strip slides upon the inside surface of the steel shell on the opposite edge of the discontinuity, to form a sliding expansion joint;

said bellows expansion joint having at least one entry port and one exit port for the entry and exit of air, respectively;

(VIII) said tube sheets supporting a plurality of ball joints, said ball joints being locked into the tube sheets using an inner tile and an outer tile and a friable, crushable gasket being located in a channeled opening formed by locking the inner tile and outer tile together;

(IX) sufficient ceramic tubes supported on each end by the ball joints;

(X) Plenum openings through each of the lateral side of the first housing and extending through the steel shell, the insulating firebrick covering, and the high temperature alumina firebrick, to allow gas to enter one lateral opening and exit through the opposite lateral opening.

38 A process for producing processed sludge using the system of claim 37.

39. A process for producing processed sludge as claimed in claim 38 wherein the ball joints used in the ball joint system are slidable ball joints.

40. A process for producing processed sludge as claimed in claim 38 wherein the ball joints used in the ball joint system are non-slidable ball joints.

41. A forced-air cooled tube sheet assembly as claimed in claim 8 wherein there is additionally present a metal bar fixedly attached to the inside surface of the steel shell and against each side of the refractory material in the second channel.